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HYDROMETALLURGY OF ZINC ORES WITH HIGH SILICA CONTENT SOLUBLE IN ACID, PARTICULARLY THOSE OF SILICATE TYPE

By Hugo Lodewijk RADINO,
Chemical Engineer,

and Pedro PEDRINI,
Economist

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HYDROMETALLURGY OF ZINC ORES WITH HIGH SILICA CONTENT SOLUBLE IN ACID, PARTICULARLY THOSE OF SILICATE TYPE

By

Hugo Lodewijk Radino, Chemical Engineer

Pedro Pedrini, Economist

1. The present paper deals with installation of zinc metallurgy in Brazil by the use of oxidised zinc ores of silicate type as raw material.

2. This type of ore is the only one so far encountered in Brazil in sufficient quantities to justify the organization of zinc metallurgy.

3. The authors point out the difficulties encountered up to now in making use of zinc silicate ores, whether by pyro- or hydrometallurgy. For pyrometallurgy this is due to their intrinsically low reducibility; for hydrometallurgy it is by reason of difficulties in filtration due to the formation of silicic acid upon lixiviation of the ore with solutions of sulphuric acid.

4. In zinc hydrometallurgy on the basis of non-oxidized, sulphide-type ores containing comparatively much less silica soluble in acid solutions, use is made of the ferric ion as an agent to transform the silica, in solution, into a gel of granular form that is easy to filter. This flocculating agent is entirely ineffective in the case of silicata ores, the content of silica soluble in acid being much higher.

5. We found that by the use of quantities of aluminum sulphate in the proportion of 7 to 10.5 per cent of Al_2O_3 in relation to the soluble silica of the ore, and by attacking the said ore with solutions of sulphuric acid at 50 g/l, extraordinarily rapid filtrations were obtained, although the volumes of the filtration cakes were relatively large—in the order of 5 kg of moist cake for each kg of zinc ore.

6. The inconvenience caused by the large volume of the cake was removed by adoption of a new technique in leaching the ore. We now acidulated a lixiviated suspension, already neutralized, with a charge of sulphuric acid solution equal to that used in the first lixiviation, and later neutralized this charge of acid with an equivalent charge of ore. This operation was repeated successively. Before the fourth and subsequent additions of acid, a third of the volume of the suspension was removed from the lixiviation tank and sent on for filtration. With each charge of acid a quantity of aluminum sulphate was added. In this way extraordinary filtration results were obtained.

7. The factory which is being built in the municipio of Itaguai, State of Rio de Janeiro, for zinc metallurgy by the hydrometallurgical process, is based on the lixiviation technique described above. The said process has been tested in a pilot plant that has been in operation for almost five years, producing 200 kg of zinc per day using calamine from Vazante and willemite from Januaria. The recovery of soluble zinc contained in the

filtration cake has been on the average above 96%, with a washing displacement on the order of 150 to 200 per cent and a filtering surface of 1 m^2 per ton of zinc per day.

8. During the phase of installation, construction of the plant will have a substantial impact on the economy of the Guanabara-State of Rio de Janeiro region, since the project will be largely based on local factors. A certain amount of machinery must be imported from São Paulo, but nothing from abroad.

9. As to its impact on the national economy as a whole when the plant goes into operation, aside from the direct effect on income (an additional net value of Cr$ 800 million a year) and its reflex effects on the regional economies where the ore deposits are located, the following facts should be considered:

i) Increase of federal revenues by approximately Cr$ 150 million annually.

ii) The workers recruited for the plant are being trained in the factory, thus contributing to improve national know-how.

iii) By virture of having carried out research, experimentation and investment to discover the new production process, the factory has contributed to increase the stimulus to the small class of Brazilian scientists, and has also given publicity abroad to our inventive and technical capacity.

iv) Use of national mineral resources.

v) By producing zinc in ingots, the factory will provide Brazil with a net annual saving in exchange, on the average, of approximately 2 million dollars.

10. The project that is being carried out represents a promising milestone on the road to Brazilian economic development. It also demonstrated the flowering in this country of a new attitude in approaching scientific research and technical problems, thus contributing to the beginning of a process of replacing imported know-how.

11. The apparent average consumption of zinc in ingots in Brazil for the 3-year period 1958/60 was 25,412 tons. It is estimated that in 1963, when the plant is scheduled to begin production, the demand for zinc in ingots in the Brazilian market will come close to 35 thousand tons a year.

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